LIMNOLOGY AND OCEANOGRAPHY

4802 74

Volume 17, 1972

LIBRARY
NATIONAL MARINE FISHERIES SERVICE
HONOLULU LABORATORY
P. O. BOX 3830
HONOLULU, HAWAII 96812

PUBLISHED BIMONTHLY AT LAWRENCE, KANSAS
By

THE AMERICAN SOCIETY OF LIMNOLOGY AND OCEANOGRAPHY, INC.

AMERICAN SOCIETY OF LIMNOLOGY AND OCEANOGRAPHY, INC.

Officers and Board of Directors

President: GEORGE H. LAUFF, Michigan State University
Vice-President: J. H. CARPENTER, National Science Foundation
Secretary: GEORGE W. SAUNDERS, JR., U.S. Atomic Energy Commission
Treasurer: ALFRED M. BEETON, University of Wisconsin-Milwaukee
Past President: I. EUGENE WALLEN, Smithsonian Institution
President of Pacific Section: RICHARD W. EPPLEY, University of California, San Diego
Secretary-Treasurer of Pacific Section: JAMES A. GAST, Humboldt State College
Members-at-Large: KARL BANSE, University of Washington (1970–1973)
DANIEL J. NELSON, Oak Ridge National Laboratory (1971–1974)
R. W. HOLMES, University of California, Santa Barbara (1972–1975)

LIMNOLOGY AND OCEANOGRAPHY

LIMNOLOGY AND OCEANOGRAPHY is a journal published bimonthly (Jan, Mar, May, Jul, Sep, Nov) at Lawrence, Kansas, by the American Society of Limnology and Oceanography, Inc.

Editor

YVETTE H. EDMONDSON (1971–1974)

Assistant Editor
FRANCIS A. RICHARDS

Editorial Associate
RAELYN COLE

Editorial Board

R. O. BRINKHURST, Fisheries Research Board of Canada, St. Andrews, N.B. (1970–1973)
EVILLE GORHAM, University of Minnesota (1970–1973)
MICHAEL M. MULLIN, University of California, San Diego (1970–1973)
ROBERT G. WETZEL, Michigan State University (1971–1974)
JOHN E. TYLER, University of California, San Diego (1971–1974)
THOMAS G. NORTHCOTE, University of British Columbia (1971–1974)
R. W. EPPLEY, University of California, San Diego (1972–1975)
H. B. N. HYNES, University of Waterloo (1972–1975)
K. H. MANN, Dalhousie University (1972–1975)
R. T. PAINE, University of Washington (1972–1975)

Membership in the Society is open to persons actively interested in any aspect of limnology or oceanography. Candidates for membership shall be nominated by two active members. Annual dues are $15.00; student members, $10.00 (3-yr limit); associate members, $1.00. The subscription rate to LIMNOLOGY AND OCEANOGRAPHY for libraries and nonmembers is $20.00 per year. Remittances from countries other than the United States must be paid in U.S. currency or its full equivalent. Please address correspondence as follows:

Memberships, general information: Dr. George W. Saunders, Jr., Secretary, P.O. Box 853, Gaithersburg, Maryland 20760.

Subscriptions, changes of address, missing issues, single and back issues (@ $3.35 each), *payment for reprints, release of copyright:* Dr. Alfred M. Beeton, Treasurer, Department of Zoology, University of Wisconsin at Milwaukee 53211.

Manuscripts, corrected proofs, editorial matters: Dr. Yvette H. Edmondson, Editor, Department of Zoology NJ-15, University of Washington, Seattle 98195.

Reprint orders: Allen Press, Inc., Lawrence, Kansas 66044.

© Copyright, 1973, by the American Society of Limnology and Oceanography, Inc.

Second-class postage paid at Lawrence, Kansas, U.S.A. 66044

TABLE OF CONTENTS

VOLUME 17, 1972

NUMBER 1, JANUARY

WANGERSKY, PETER J. The control of seawater *p*H by ion pairing 1

NEIHOF, REX A., AND GEORGE I. LOEB. The surface charge of particulate matter in seawater 7

MANHEIM, FRANK T., JOHN C. HATHAWAY, AND ELAZAR UCHUPI. Suspended matter in surface waters of the northern Gulf of Mexico 17

SMITH, S. V. Production of calcium carbonate on the mainland shelf of southern California 28

GAINES, ARTHUR G., JR., AND MICHAEL E. Q. PILSON. Anoxic water in the Pettaquamscutt River 42

HARRISON, MICHAEL J., ROBERT E. PACHA, AND RICHARD Y. MORITA. Solubilization of inorganic phosphates by bacteria isolated from Upper Klamath Lake sediment 50

MCROY, C. PETER, ROBERT J. BARSDATE, AND MARY NEBERT. Phosphorus cycling in an eelgrass (*Zostera marina* L.) ecosystem 58

MEGARD, ROBERT O. Phytoplankton, photosynthesis, and phosphorus in Lake Minnetonka, Minnesota 68

HOLLAND, RUTH E., AND ALFRED M. BEETON. Significance to eutrophication of spatial differences in nutrients and diatoms in Lake Michigan 88

SHANNON, EARL E., AND PATRICK L. BREZONIK. Limnological characteristics of north and central Florida lakes 97

HUGHES, ROGER N., D. L. PEER, AND K. H. MANN. Use of multivariate analysis to identify functional components of the benthos in St. Margaret's Bay, Nova Scotia 111

BRINKHURST, RALPH O., KIAN E. CHUA, AND NARINDER K. KAUSHIK. Interspecific interactions and selective feeding by tubificid oligochaetes 122

Notes

JOSEPHSON, ROBERT K., AND KARL W. FLESSA. Cryolite: A medium for the study of burrowing aquatic organisms 134

STOCKER, Z. S. J., AND D. DUDLEY WILLIAMS. A freezing core method for describing the vertical distribution of sediments in a streambed 136

CHUTTER, F. M. A reappraisal of Needham and Usinger's data on the variability of a stream fauna when sampled with a Surber sampler 139

SMITH, K. L., JR., AND JAMES D. HOWARD. Comparison of a grab sampler and large volume corer 142

PAERL, HANS W., AND CHARLES R. GOLDMAN. Heterotrophic assays in the detection of water masses at Lake Tahoe, California 145

COULON, CHRISTOPHER, AND VERA ALEXANDER. A sliding-chamber phytoplankton settling technique for making permanent quantitative slides with applications in fluorescent microscopy and autoradiography 149

HARRISON, STANLEY M., AND ALLAN W. H. BÉ. A rotary system for calibrating flowmeters used for plankton sampling 152

HARVEY, GEORGE W., AND LINDEN A. BURZELL. A simple microlayer method for small samples 156

TERRELL, ROBERT E., AND THEODORE GREEN III. Investigations of the surface velocity structure of lake currents 158

PROCEEDINGS OF THE AMERICAN SOCIETY OF LIMNOLOGY AND OCEANOGRAPHY, INC. 161

AMERICAN SOCIETY OF LIMNOLOGY AND OCEANOGRAPHY, INC. FINANCIAL STATEMENT 163

Book Reviews

Evolution of sedimentary rocks (R. M. Garrels and F. T. Mackenzie) ---- D. A. Livingstone 165

Ion selective electrodes for the analysis of natural waters (M. Whitfield) ---- Frank Manheim 165

Dams and other disasters (A. E. Morgan) ---- Fred Cleaver 166

Aquatic Oligochaeta of the world (R. O. Brinkhurst and B. G. M. Jamieson) ---- W. T. Edmondson 166

Field and laboratory microbial ecology (R. W. Gordon) ---- James T. Staley 167

Glacial and Quaternary geology (R. F. Flint) ---- D. A. Livingstone 167

Announcements ---- 168

Number 2, March

Zaret, Thomas M. Predators, invisible prey, and the nature of polymorphism in the Cladocera (class Crustacea) ---- 171

Grigg, Richard W. Orientation and growth form of sea fans ---- 185

Schoener, Amy. Fecundity and possible mode of development of some deep-sea ophiuroids 193

Wulff, Barry L., and C. David McIntire. Laboratory studies of assemblages of attached estuarine diatoms ---- 200

Wiegert, Richard G., and Peter C. Fraleigh. Ecology of Yellowstone thermal effluent systems: Net primary production and species diversity of a successional blue-green algal mat ---- 215

Grenney, William J., and David A. Bella. Field study and mathematical model of the slack-water buildup of a pollutant in a tidal river ---- 229

Friebertshauser, Mark A., and Alyn C. Duxbury. A water budget study of Puget Sound and its subregions ---- 237

Otsuki, Akira, and Takahisa Hanya. Production of dissolved organic matter from dead green algal cells. I. Aerobic microbial decomposition ---- 248

Otsuki, Akira, and Takahisa Hanya. Production of dissolved organic matter from dead green algal cells. II. Anaerobic microbial decomposition ---- 258

Carpenter, Edward J., Charles C. Remsen, and Stanley W. Watson. Utilization of urea by some marine phytoplankters ---- 265

Boothe, Paul N., and George A. Knauer. The possible importance of fecal material in the biological amplification of trace and heavy metals ---- 270

Berger, Wolfgang H., and David J. W. Piper. Planktonic foraminifera: Differential settling, dissolution, and redeposition ---- 275

Notes

Jeter, Hewitt W., Ernst Føyn, Michael King, and Louis I. Gordon. The expendable bathyoxymeter ---- 288

Fowler, Scott W., and Lawrence F. Small. Sinking rates of euphausiid fecal pellets ---- 293

Bright, Thomas, Frank Ferrari, Douglas Martin, and Guy A. Franceschini. Effects of a total solar eclipse on the vertical distribution of certain oceanic zooplankters ---- 296

Cunningham, Linda. Vertical migrations of *Daphnia* and copepods under the ice 301

Geiling, W. T., and Robert S. Campbell. The effect of temperature on the development rate of the major life stages of *Diaptomus pallidus* Herrick ---- 304

Szekielda, K.-H., V. Salomonson, and L. J. Allison. Rapid variations of sea surface temperature in the Persian Gulf as recorded by Nimbus 2 HRIR ---- 307

Whitledge, T. E., and R. C. Dugdale. Creatine in seawater ---- 309

OHWADA, KOUICHI, AND NOBUO TAGA. Vitamin B_{12}, thiamine, and biotin in Lake Sagami 315

GOERING, J. J., AND P. L. PARKER. Nitrogen fixation by epiphytes on sea grasses 320

Announcement 324

Book Reviews

Mikrobiologie der Gewässer (G. Reinheimer) ..... JAMES T. STALEY 325

Methods for the estimation of production of aquatic animals (G. G. Winberg [ed.]) ..... FRANK RIGLER 325

NUMBER 3, MAY

SHELDON, R. W., A. PRAKASH, AND W. H. SUTCLIFFE, JR. The size distribution of particles in the ocean 327

REISWIG, HENRY M. The spectrum of particulate organic matter of shallow-bottom boundary waters of Jamaica 341

LODER, THEODORE C., AND DONALD W. HOOD. Distribution of organic carbon in a glacial estuary in Alaska 349

HENDY, C. H., M. J. SELBY, AND A. T. WILSON. Deep Lake, Cape Barne—Antarctica 356

ROFF, JOHN C., AND JOHN C. H. CARTER. Life cycle and seasonal abundance of the copepod *Limnocalanus macrurus* Sars in a high arctic lake 363

MCCARTHY, JAMES J., AND RICHARD W. EPPLEY. A comparison of chemical, isotopic, and enzymatic methods for measuring nitrogen assimilation of marine phytoplankton 371

WHITFIELD, M. The electrochemical characteristics of natural redox cells 383

FOLGER, DAVID W., ROBERT H. MEADE, BLAIR F. JONES, AND ROBERT L. CORY. Sediments and waters of Somes Sound, a fjordlike estuary in Maine 394

PALMER, M. D., AND J. BRYAN IZATT. Lake movements with partial ice cover 403

LARSON, DOUGLAS W. Temperature, transparency, and phytoplankton productivity in Crater Lake, Oregon 410

KIEFER, DALE A., OSMUND HOLM-HANSEN, CHARLES R. GOLDMAN, ROBERT RICHARDS, AND THOMAS BERMAN. Phytoplankton in Lake Tahoe: Deep-living populations 418

KROES, H. W. Growth interactions between *Chlamydomonas globosa* Snow and *Chlorococcum ellipsoideum* Deason and Bold: The role of extracellular products 423

JEFFRIES, H. PERRY. Fatty-acid ecology of a tidal marsh 433

LOVRIĆ, G., AND P. STROHAL. Radioecological investigations in a thermal spring region 441

GOODYEAR, C. PHILLIP, CLAUDE E. BOYD, AND ROBERT J. BEYERS. Relationships between primary productivity and mosquitofish (*Gambusia affinis*) production in large microcosms 445

Notes

NEAL, VICTOR T., STEPHEN J. NESHYBA, AND WARREN W. DENNER. Vertical temperature structure in Crater Lake, Oregon 451

HORNER, RITA, AND V. ALEXANDER. Algal populations in arctic sea ice: An investigation of heterotrophy 454

BUNT, J. S., AND C. C. LEE. Data on the composition and dark survival of four sea-ice microalgae 458

IDSO, SHERWOOD B. Modifications of shielded net radiometers to measure solar radiation profiles in water 462

BURR, A. H., AND M. J. DUNCAN. Portable spectroradiometer for underwater environments 466

KROGER, RICHARD L. Underestimation of standing crop by the Surber sampler 475

CLIFFORD, HUGH F. Comparison of samples of stream bottom fauna collected during the day and at night 479

BAYNE, DAVID R., AND JOHN M. LAWRENCE. Separating constituents of natural phytoplankton populations by continuous particle electrophoresis 481

MORRIS, IAN, AND CHARLES S. YENTSCH. A new method for concentrating phytoplankton by filtration with continuous stirring 490

SHELDON, R. W. Size separation of marine seston by membrane and glass-fiber filters 494

Comment

MORALES, ROSARIO. Models: 1 499

STEARNS, STEPHEN C. Models: 2 500

Book Reviews

The New York Times encyclopedic dictionary of the environment (P. Sarnoff) ..... W. T. EDMONDSON 502

Red salmon, brown bear (T. J. Walker) ..... RAELYN COLE 502

Life in mud and sand (S. K. Eltringham) ..... ALAN J. KOHN 503

NUMBER 4, JULY

RHEE, G-YULL. Competition between an alga and an aquatic bacterium for phosphate 505

THOMAS, WILLIAM H., AND ANNE N. DODSON. On nitrogen deficiency in tropical Pacific oceanic phytoplankton. II. Photosynthetic and cellular characteristics of a chemostat-grown diatom 515

GUNDERSEN, K., C. W. MOUNTAIN, DIANE TAYLOR, R. OHYE, AND J. SHEN. Some chemical and microbiological observations in the Pacific Ocean off the Hawaiian Islands 524

TUTTLE, JON H., AND HOLGER W. JANNASCH. Occurrence and types of thiobacillus-like bacteria in the sea 532

HOBBIE, JOHN E., OSMUND HOLM-HANSEN, THEODORE T. PACKARD, LAWRENCE R. POMEROY, RAYMOND W. SHELDON, JAMES P. THOMAS, AND WILLIAM J. WIEBE. A study of the distribution and activity of microorganisms in ocean water 544

COOPER, MARY F., AND RICHARD Y. MORITA. Interaction of salinity and temperature on net protein synthesis and viability of *Vibrio marinus* 556

BEZDEK, H. F., AND A. F. CARLUCCI. Surface concentration of marine bacteria 566

NISSENBAUM, ARIE, AND I. R. KAPLAN. Chemical and isotopic evidence for the *in situ* origin of marine humic substances 570

HARGRAVE, BARRY T. Aerobic decomposition of sediment and detritus as a function of particle surface area and organic content 583

GLOOSCHENKO, WALTER A., JAMES E. MOORE, AND RICHARD A. VOLLENWEIDER. The seasonal cycle of pheo-pigments in Lake Ontario with particular emphasis on the role of zooplankton grazing 597

REIMOLD, ROBERT J. The movement of phosphorus through the salt marsh cord grass, *Spartina alterniflora* Loisel 606

Notes

WILSON, D. O. Phosphate nutrition of the aquatic angiosperm, *Myriophyllum exalbescens* Fern. 612

BERMAN, T. Profiles of chlorophyll concentrations by *in vivo* fluorescence: Some limnological applications 616

GORHAM, EVILLE, AND JON E. SANGER. Fossil pigments in the surface sediments of a meromictic lake 618

MACHAN, RUDOLF, AND JÖRG OTT. Problems and methods of continuous *in situ* measurements of redox potentials in marine sediments 622

MAKEMSON, JOHN C. An interstitial water sampler for sandy beaches 626

RUPPERT, EDWARD E. An efficient, quantitative method for sampling the meiobenthos ... 629

CLASBY, R. C., W. S. REEBURGH, AND VERA ALEXANDER. A close-interval syringe sampler ... 632

GIBSON, C. E., AND D. A. STEWART. Changes in the water chemistry of Lough Neagh over a 10-year period ... 633

GROSS, M. GRANT, AND D. F. BUMPUS. Residual drift of near-bottom waters in Long Island Sound, 1969 ... 636

DONN, WILLIAM L., AND DAVID M. WOLF. Seiche and water level fluctuations in Grindavik Harbor, Iceland ... 639

KERSTING, KEES. A nitrogen correction for caloric values ... 643

BAUDOIN, M. F., AND O. RAVERA. Weight, size, and chemical composition of some freshwater zooplankters: *Daphnia hyalina* (Leydig) ... 645

Announcement ... 650

NUMBER 5, SEPTEMBER

MURRAY, STEPHEN P. Turbulent diffusion of oil in the ocean ... 651

ZIRINO, ALBERTO, AND SACHIO YAMAMOTO. A *p*H-dependent model for the chemical speciation of copper, zinc, cadmium, and lead in seawater ... 661

LEE, A. H., AND G. K. RODGERS. Temperature fine structure in Lake Ontario ... 672

HORNE, ALEXANDER J., AND CHARLES R. GOLDMAN. Nitrogen fixation in Clear Lake, California. I. Seasonal variation and the role of heterocysts ... 678

HORNE, ALEXANDER J., J. E. DILLARD, D. K. FUJITA, AND C. R. GOLDMAN. Nitrogen fixation in Clear Lake, California. II. Synoptic studies on the autumn *Anabaena* bloom 693

SAUNDERS, GEORGE W. Potential heterotrophy in a natural population of *Oscillatoria agardhii* var. *isothrix* Skuja ... 704

KALFF, J. Net plankton and nanoplankton production and biomass in a north temperate zone lake ... 712

FEDORENKO, ALICE Y., AND MICHAEL C. SWIFT. Comparative biology of *Chaoborus americanus* and *Chaoborus trivittatus* in Eunice Lake, British Columbia ... 721

WELCH, EUGENE B., RICHARD M. EMERY, ROBERT I. MATSUDA, AND WILLIAM A. DAWSON. The relation of periphytic and planktonic algal growth in an estuary to hydrographic factors ... 731

MCCARTHY, JAMES J. The uptake of urea by natural populations of marine phytoplankton 738

CLARK, M. E., G. A. JACKSON, AND W. J. NORTH. Dissolved free amino acids in southern California coastal waters ... 749

Notes

FIELD, J. G. Some observations on the release of dissolved organic carbon by the sea urchin, *Strongylocentrotus droebachiensis* ... 759

WILSON, MILDRED STRATTON. Copepods of marine affinities from mountain lakes of western North America ... 762

OTSUKI, AKIRA, AND ROBERT G. WETZEL. Coprecipitation of phosphate with carbonates in a marl lake ... 763

CASTENHOLZ, RICHARD W. Hot spring microbial communities recreated in modified "Winogradski columns" ... 767

YENTSCH, CLARICE M., CHARLES S. YENTSCH, AND JAMES P. PERRAS. Alkaline phosphatase activity in the tropical marine blue-green alga, *Oscillatoria erythraea* ("*Trichodesmium*") ... 772

CARLUCCI, A. F., AND PEGGY M. BOWES. Determination of vitamin B_{12}, thiamine, and biotin in Lake Tahoe waters using modified marine bioassay techniques ... 774

MARVIN, K. T., R. R. PROCTOR, JR., AND R. A. NEAL. Some effects of filtration on the determination of nutrients in fresh and salt water ... 777

HARRIS, JOHN E., THOMAS R. MCKEE, RAYMOND C. WILSON, JR., AND U. GRANT WHITEHOUSE. Preparation of membrane filter samples for direct examination with an electron microscope 784

CASWELL, HAL. On instantaneous and finite birth rates 787

Comment

EDMONDSON, W. T. Instantaneous birth rates of zooplankton 792

MANN, K. H. On communicating ecological information to the general public 795

SHELDON, R. W., AND S. R. KERR. The population density of monsters in Loch Ness 796

Book Reviews

Fertility of the sea (J. D. Costlow [ed.]) ..... T. R. PARSONS 799

Waters and aqueous solutions: Structure, thermodynamics and transport processes (R. A. Horne [ed.]) ..... W. DROST-HANSEN 799

A manual on methods for the assessment of secondary productivity in fresh waters (W. T. Edmondson and G. G. Winberg [eds.]) ..... LIVIA TONOLLI 800

The face of the deep (B. C. Heezen and C. D. Hollister) ..... RICHARD EBERHART 801

Conservation and productivity of natural waters (R. W. Edwards and D. J. Garrod [eds.]) ..... R. O. BRINKHURST 802

Project aqua (H. Luther and J. Rzóska [compilers]) ..... PETER W. FRANK 803

NUMBER 6, NOVEMBER

FROST, B. W. Effects of size and concentration of food particles on the feeding behavior of the marine planktonic copepod *Calanus pacificus* 805

WARSHAW, STEPHEN J. Effects of alewives (*Alosa pseudoharengus*) on the zooplankton of Lake Wononskopomuc, Connecticut 816

GORDON, HOWARD R., AND OTIS B. BROWN. A theoretical model of light scattering by Sargasso Sea particulates 826

CARDER, KENDALL L., RICHARD D. TOMLINSON, AND GEORGE F. BEARDSLEY, JR. A technique for the estimation of indices of refraction of marine phytoplankters 833

SANGER, JON E., AND EVILLE GORHAM. Stratigraphy of fossil pigments as a guide to the postglacial history of Kirchner Marsh, Minnesota 840

KEMP, A. L. W., AND A. MUDROCHOVA. Distribution and forms of nitrogen in a Lake Ontario sediment core 855

KNAUER, GEORGE A., AND JOHN H. MARTIN. Mercury in a marine pelagic food chain 868

BERTINE, K. K., AND E. D. GOLDBERG. Trace elements in clams, mussels, and shrimp 877

CLINE, JOEL D., AND FRANCIS A. RICHARDS. Oxygen deficient conditions and nitrate reduction in the eastern tropical North Pacific Ocean 885

Notes

ESAIAS, WAYNE E., AND HERBERT C. CURL, JR. Effect of dinoflagellate bioluminescence on copepod ingestion rates 901

BALCH, NORVAL. ATP content of *Calanus finmarchicus* 906

SNOW, NORMAN B. The effect of season and animal size on the caloric content of *Daphnia pulicaria* Forbes 909

PORTER, KAREN GLAUS. A method for the *in situ* study of zooplankton grazing effects on algal species composition and standing crop 913

TIMMS, B. V. A meromictic lake in Australia 918

MOTTEN, ALEXANDER F., AND CHARLES A. S. HALL. Edaphic factors override a possible gradient of ecological maturity indices in a small stream 922

WETZEL, ROBERT G., AND BRUCE A. MANNY. Decomposition of dissolved organic carbon and nitrogen compounds from leaves in an experimental hard-water stream 927

HAGER, S. W., E. L. ATLAS, L. I. GORDON, A. W. MANTYLA, AND P. K. PARK. A comparison at sea of manual and AutoAnalyzer analysis of phosphate, nitrate, and silicate 931

GERCHAKOV, SOL M., AND PATRICK G. HATCHER. Improved technique for analysis of carbohydrates in sediments 938

WIUM-ANDERSEN, S., AND JENS M. ANDERSEN. Carbon dioxide content of the interstitial water in the sediment of Grane Langsø, a Danish *Lobelia* lake 943

WIUM-ANDERSEN, S., AND JENS M. ANDERSEN. The influence of vegetation on the redox profile of the sediment of Grane Langsø, a Danish *Lobelia* lake 948

SCHINDLER, J. E., J. J. ALBERTS, AND K. R. HONICK. A preliminary investigation of organic-inorganic associations in a stagnating system 952

Comment

PYTKOWICZ, RICARDO M. Comments on "The control of seawater *p*H by ion pairing" (P. J. Wangersky) 958

KESTER, DANA R. Effect of ion pairing on the *p*H of seawater 959

WANGERSKY, PETER J. Ion pairing and *p*H: A reply 960

EDMONDSON, YVETTE H. Editorial comment: Referees 963

Book Reviews

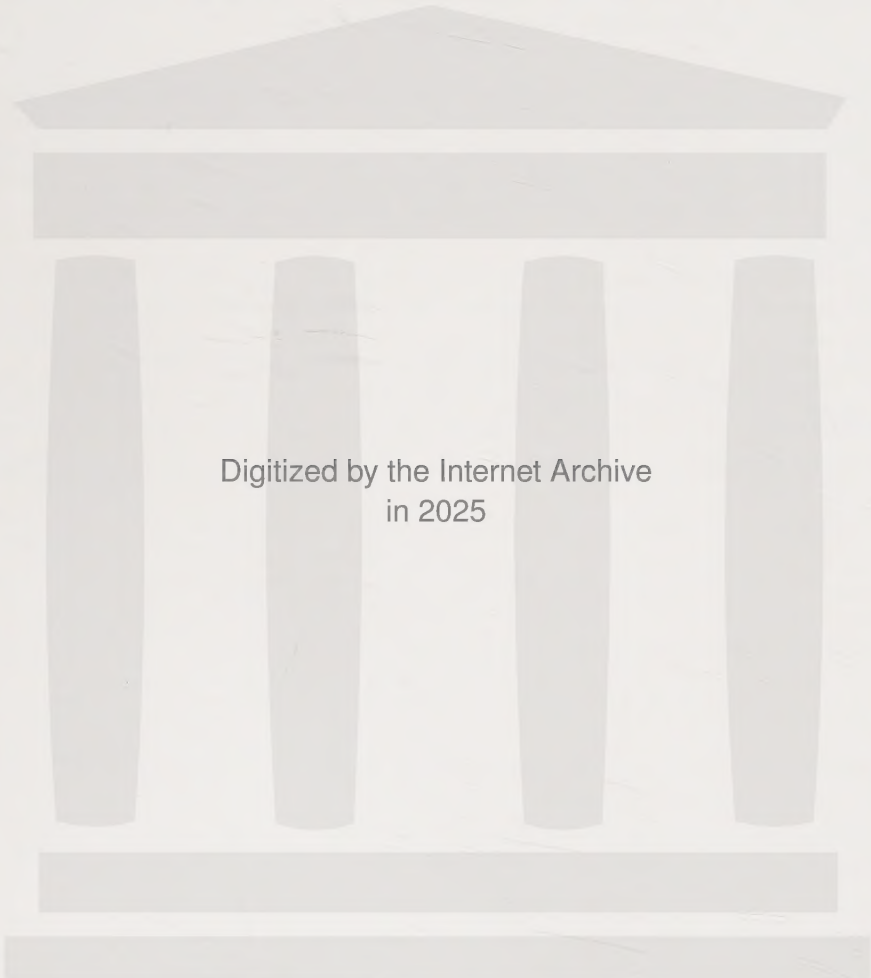
Nutrients and eutrophication (G. E. Likens [ed.]) ..... G. E. HUTCHINSON 965

Methods of the study of marine benthos (N. A. Holme and A. D. McIntyre [eds.]) ..... E. W. FAGER 968

The Columbia River estuary and adjacent ocean waters (A. T. Pruter and D. L. Alverson [eds.]) ..... G. HOWELLS 969

Books Received 971

Author and title index to volume 17 973


Digitized by the Internet Archive
in 2025

https://archive.org/details/limnology-and-oceanography_1972_17_contents